

WHAT IS CLAIMED IS:

1. Non-aqueous electrophoretic capsules comprising a halogenated polymeric shell and an electrophoretic composition enclosed therein wherein said electrophoretic composition comprises charged pigment particles or 5 pigment-containing microparticles dispersed in a dielectric solvent.
2. The non-aqueous capsules of Claim 1 wherein said halogenated polymeric shell is a fluorinated polymeric shell.
3. The non-aqueous capsules of Claim 1 wherein said dielectric solvent is a halogenated solvent or solvent mixture.
- 10 4. The non-aqueous capsules of Claim 3 wherein said halogenated solvent is a fluorinated solvent having a fluorine content higher than 20% by weight.
- 15 5. The non-aqueous capsules of Claim 4 wherein said halogenated solvent is a fluorinated solvent having a fluorine content higher than 50% by weight.
6. The non-aqueous capsules of Claim 4 wherein said fluorinated solvent or solvent mixture comprises a perfluoropolyether or hydrofluoropolyether.
- 20 7. The non-aqueous capsules of Claim 6 wherein said fluoropolyether or hydrofluoropolyether is selected from a group consisting of K- and E- series from Du Pont and HT- or ZT- series from Solvay Solexis.
8. The non-aqueous capsules of Claim 1 wherein said pigment particles are TiO₂ particles or TiO₂-containing microparticles.
- 25 9. The non-aqueous capsules of Claim 1 wherein said pigment-containing microparticles are TiO₂-containing microparticles that are density matched to the dielectric solvent.

10. The non-aqueous capsules of Claim 1 wherein said electrophoretic composition further comprises a charge control agent.

11. The non-aqueous capsules of Claim 1 wherein said electrophoretic composition further comprises a contrast colorant.

5 12. The non-aqueous capsules of Claim 1 wherein said electrophoretic composition further comprises an additive.

13. The non-aqueous capsules of Claim 12 wherein the additive is a catalyst for the shell-forming reaction, a charge adjuvant, an electrolyte, an antioxidant, a UV stabilizer, a singlet oxygen quencher, a gas absorber, a 10 surfactant, a protective colloid or polymeric dispersant or a rheology modifier.

14. The non-aqueous capsules of Claim 13 wherein said additive is halogenated.

15. The non-aqueous capsules of Claim 14 wherein said additive is fluorinated.

16. An encapsulation process for the preparation of non-aqueous capsules suitable as display cells for an electrophoretic display, which process comprises emulsifying an internal phase comprising pigment particles or pigment-containing microparticles dispersed in a halogenated solvent and a halogenated shell-forming material into an external phase comprising a 20 complementary chain extender or crosslinker in an organic solvent.

17. The process of Claim 16 wherein said halogenated solvent is a fluorinated solvent or solvent mixture having a total fluorine content higher than 20% by weight.

18. The process of Claim 17 wherein said halogenated solvent is a 25 fluorinated solvent or solvent mixture having a total fluorine content higher than 50% by weight.

19. The process of Claim 17 wherein said fluorinated solvent is a perfluoropolyether or hydrofluoropolyether.

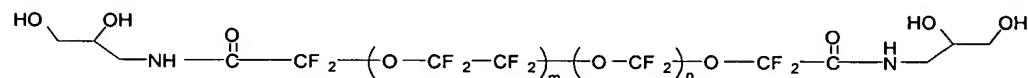
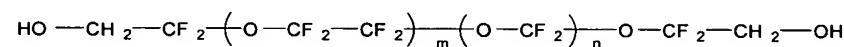
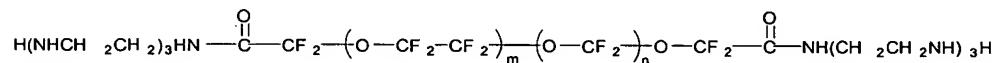
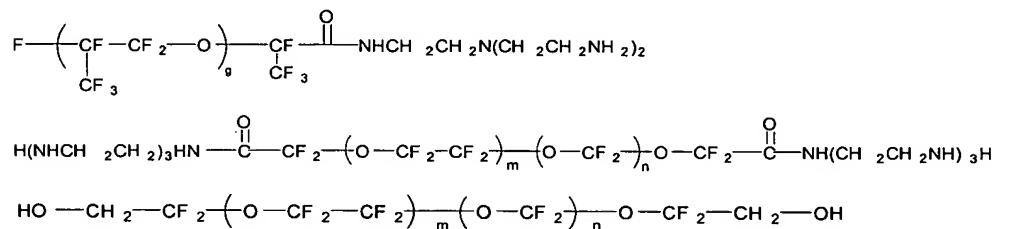
20. The process of Claim 19 wherein said fluoropolyether or hydrofluoropolyether is selected from a group consisting of K- and E- series from Du Pont and HT- or ZT- series from Solvay Solexis.

21. The process of Claim 16 wherein said shell-forming material in the 5 internal phase is a halogenated reactive monomer or oligomer selected from the group consisting of halogenated multifunctional amines, isocyanates, thioisocyanates, epoxides, acid chlorides, acid anhydrides, chloroformates, alkoxy silanes, amines, urea, thiourea, thiols, alcohols and precondensates thereof.

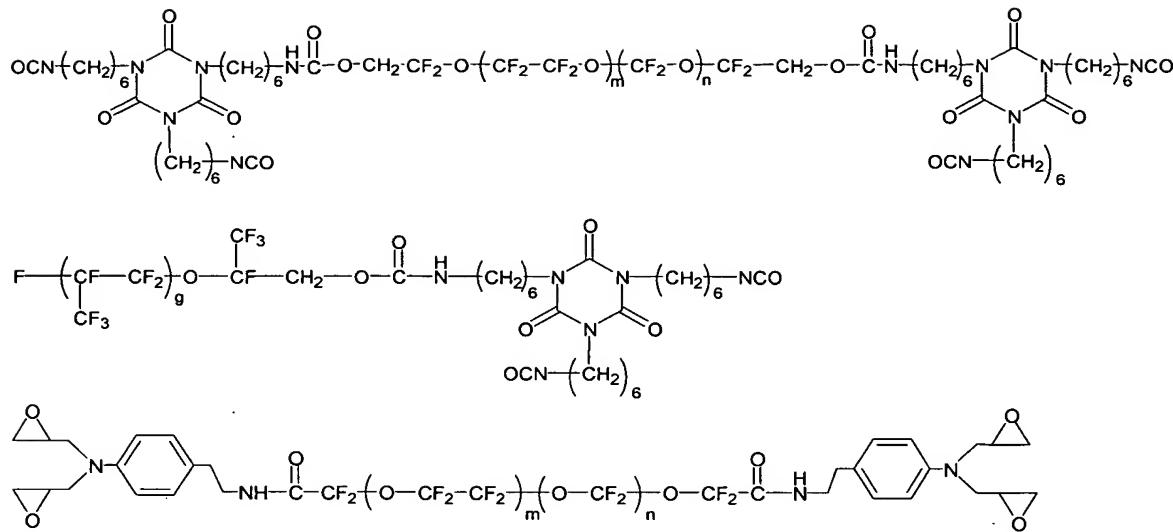
10 22. The process of Claim 21 wherein said halogenated reactive monomer or oligomer is a fluorinated monomer or oligomer having a fluorine content higher than 10% by weight.

23. The process of Claim 22 wherein said halogenated reactive monomer or oligomer is a fluorinated monomer or oligomer having a fluorine 15 content higher than 30% by weight.

24. The process of Claim 16 wherein said halogenated shell-forming material is selected from a group consisting of



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wherein g, m and n are independently in the range of 1-10,000.

5 25. The process of Claim 24 wherein g, m and n are independently in the range of 1-5,000.

26. The process of Claim 24 wherein said fluorinated shell-forming material has a molecular weight ranging from 300 to 100,000.

10 27. The process of Claim 26 wherein said fluorinated shell-forming material has a molecular weight ranging from 500 to 30,000.

28. The process of Claim 16 wherein said organic solvent in the continuous phase is immiscible with the halogenated solvent in the internal phase.

15 29. The process of Claim 28 wherein said organic solvent has a boiling temperature between 40-200°C.

30. The process of Claim 29 wherein said organic solvent has boiling temperature between 60-150°C.

20 31. The process of Claim 28 wherein said organic solvent is hexane, cyclohexane, heptane, octane, nonane, decalin, docecybenzene, Isopar, nonapar, ethyl acetate, propyl acetate, butyl acetate, acetone,

methyleneethylketone (MEK), methylpropylketone (MPK), methylbutylketone (MBK), tetrahydrofuran (THF), 1,2-dialkoxy ethane or 2-methoxyethyl acetate.

32. The process of Claim 16 wherein said halogenated shell-forming material in the internal phase reacts with the complementary chain extender or 5 crosslinker from the external phase to form a crosslinked shell at the interface and enclose the internal phase therein.

33. The process of Claim 32 wherein the pair of functional group of the shell-forming material in the internal phase and the functional group of the complementary chain extender or crosslinker in the external phase is selected 10 from the group consisting of amine/isocyanate, amine/thioisocyanate, amine/acid chloride or anhydride, amine/chloroformate, amine/epoxide, alcohol/isocyanate, urea/isocyanate, alcohol/thioisocyanate, thiol/isocyanate, thiol/thioisocyanate, urea/thioisocyanate, thiourea/isocyanate, thiourea/thioisocyanate, carbodiimide/urea, carbodiimide/epoxide, 15 alcohol/siloxane and isocyanate/water.

34. The process of Claim 16 wherein said halogenated shell-forming material in the internal phase is a fluorinated multifunctional amine, alcohol, epoxide or isocyanate.

35. The process of Claim 16 wherein said internal phase further 20 comprises a charge control agent.

36. The process of Claim 16 wherein said internal phase further comprises a contrast colorant.

37. The process of Claim 16 wherein said internal phase further comprises a fugitive solvent which may be stripped off during or after the 25 encapsulation process..

38. The process of Claim 16 wherein said internal phase further comprises an additive.

39. The process of Claim 38 wherein said additive is halogenated.

40. The process of Claim 39 wherein said additive is fluorinated.

41. The process of Claim 38 wherein the additive in the internal phase is a catalyst for the shell-forming reaction, a charge adjuvant, an electrolyte, an antioxidant, a UV stabilizer, a singlet oxygen quencher, a gas absorber, a surfactant, a protective colloid or polymeric dispersant or a rheology modifier.

5 42. The process of Claim 16 wherein said external phase further comprises a protective colloid.

43. The process of Claim 16 wherein said external phase further comprises an additive.

10 44. The process of Claim 43 wherein the additive is a catalyst for the shell-forming reaction, a charge adjuvant, an electrolyte, an antioxidant, a UV stabilizer, a singlet oxygen quencher, a gas absorber, a surfactant, a protective colloid or polymeric dispersant or a rheology modifier.

45. An electrophoretic display or device comprising:

15 a) an arrangement of non-aqueous capsules comprising a halogenated polymeric shell and an electrophoretic composition enclosed therein wherein said electrophoretic composition comprises charged pigment particles or pigment-containing microparticles dispersed in a dielectric solvent;

b) a binder binding the non-aqueous capsules, and

20 c) a first substrate on which the capsules and binder are coated.

46. The electrophoretic display or device of Claim 45 further comprising a protective overcoat on the capsule layer.

25 47. The electrophoretic display or device of Claim 45 further comprising a second substrate disposed onto the capsule layer.

48. The electrophoretic display or device of Claim 47 wherein at least one of the two substrates is an electrode substrate.

49. The electrophoretic display or device of Claim 47 wherein at least one of the two substrates is transparent.

50. The electrophoretic display or device of Claim 47 wherein at least one of the substrates comprises an electrode layer facing the capsule layer.

5 51. The electrophoretic display or device of Claim 50 wherein the substrate or electrode layer is disposed onto the capsule layer by coating, printing, vapor deposition, sputtering, lamination or a combination thereof.

52. The electrophoretic display or device of Claim 46 wherein said protective overcoat comprises a particulate filler.

10 53. The electrophoretic display or device of Claim 45 further comprises an overcoat on the non-capsule-coated surface of the first substrate.

54. The electrophoretic display or device of 53 wherein said overcoat comprises a particulate filler.

15 55. The electrophoretic display or device of Claim 47 further comprises an overcoat on the non-capsule-contacted surface of the second substrate.

56. The electrophoretic display or device of Claim 55 wherein said overcoat comprises a particulate filler.

20 57. The electrophoretic display or device of Claim 45 wherein said dielectric solvent is a halogenated solvent or solvent mixture.

58. The electrophoretic display or device of Claim 57 wherein the halogenated solvent is a fluorinated solvent fluorinated solvent having a total fluorine content higher than 20% by weight.

25 59. The electrophoretic display or device of Claim 58 wherein the halogenated solvent is a fluorinated solvent fluorinated solvent having a total fluorine content higher than 50% by weight.

60. The electrophoretic display or device of Claim 58 wherein said fluorinated solvent is a perfluoropolyether or hydrofluoropolyether.

61. The electrophoretic display or device of Claim 60 wherein said fluoropolyether or hydrofluoropolyether is selected from the group consisting of
5 K- and E- series from Du Pont and HT- or ZT- series from Solvay Solexis.

62. The electrophoretic display or device of Claim 45 wherein said pigment is TiO_2 .

63. The electrophoretic composition of the display or device of
Claim 45 further comprises a contrast colorant.

10 64. The electrophoretic composition of the display or device of
Claim 45 further comprises a charge controlling agent.